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THE 1987 WESTERN SPRUCE BUDWORM CONDITIONS IN THE INTERMOUNTAIN REGION

by
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ABSTRACT

Based on aerial detection surveys, host trees on approximately 873,600 acres of forest land in the Intermountain Region were visibly defoliated by western spruce budworm (WSBW) during 1987, almost a three-fold decrease from 1986. Acreage and intensity of observed defoliation decreased on the Boise, Caribou, Challis, Payette, Salmon, Sawtooth, and Targhee National Forests in Southern Idaho; on the Bridger-Teton National Forest in Wyoming; and on the Dixie and Wasatch-Cache National Forests in Utah. Most defoliation intensity was classified as light or moderate. Management alternatives and recommendations are presented.

INTRODUCTION

Acreage of host conifers visibly defoliated by western spruce budworm (WSBW), Choristoneura occidentalis Freeman, has been documented for southern Idaho Forests since 1952 (Table 1). Defoliation has resulted in incremental growth loss, varying degrees of topkill, and understory mortality (Beveridge and Cahill 1984). In areas which have experienced several years of continuous heavy defoliation, widespread mortality of single and groups of host trees has occurred.

Currently, to assist land managers in identifying intensity and extent of existing infestations, aerial detection surveys of National Forest, other forested federal, and adjacent state and private lands in the Intermountain Region are conducted by Forest Pest Management (Beveridge and Knapp 1984). Field evaluations to verify aerial observations are conducted on National Forests which have substantial infested acreage.

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TECHNICAL INFORMATION

Insect. Western spruce budworm, Choristoneura occidentalis Free.

Hosts. Douglas-fir, Pseudotsuga menziesii (Mirb) Franco.
Grand fir, Abies grandis (Dougl.) Lindl.
White fir, Abies concolor (Gord. & Glend.) Lindl.
Subalpine fir, Abies lasiocarpa (Hook.) Nutt.
Blue spruce, Picea pungens Engelm.
Engelmann spruce, Picea engelmannii Parry.

Life History. The WSBW completes one generation each year.

Stage	Time	Where active
Egg	August	on needles
Small larvae (1st-2nd instar)	August-overwinter	in hibernaculam (silken cocoons) on branches and trunk
Larger larvae (3rd-5th instar)	May-June	on buds, strobili, and foliage
Pupae	late June-early July	on foliage
Adults	mid July-August	in flight

Evidence of Infestation.

1. Presence of partially eaten foliage
2. Immature and/or mature larvae feeding on current year's needles
3. Current year's shoots webbed together.
4. Trees dying from the top downward after several years of heavy defoliation.

METHODS

Regionwide aerial detection surveys to detect WSBW and other pest activity were conducted on a drainage-by-drainage basis from low-flying fixed-wing aircraft during July and August. Most forested lands in the Intermountain Region (except lands within wilderness areas, large tracts of pinyon-juniper, and other "non-commercial" lands) were surveyed. Location of three intensity classes of defoliation was mapped into one of three classes: light, moderate, or heavy as described by Beveridge and Knapp (1984).

In areas with substantial WSBW defoliation, field observations of extent and intensity of defoliation were made by FPM during routine field evaluations. These observations were used to verify aerial detection survey information.

Table 1.--Acres of defoliation by western spruce budworm in the Intermountain Region from 1952 through 1987.

Year	Total Acres*	State			Source of Information**
		Idaho	Utah	Wyoming	
1952	1,000,000	1,000,000			Johnson & Denton
1953	500,000	500,000			1975
1954	1,000,000	1,000,000			"
1955	1,175,000	1,175,000			"
1956	1,127,500	1,127,500			"
1957	1,172,940	1,172,940			"
1958	974,710	974,710			"
1959	499,000	499,000			"
1960	516,000	516,000			"
1961	1,425,000	1,425,000			"
1962	1,641,000	1,641,000			"
1963	1,632,000	1,632,000			"
1964	2,296,000	2,276,000	20,000		"
1965	1,515,100	1,495,100	10,000	10,000	"
1966	992,200	958,400		33,800	"
1967	218,700	163,900	100	54,700	"
1968	505,500	395,300	400	109,800	"
1969	544,400	463,200	400	80,800	"
1970	307,720	239,200	120	68,400	"
1971	373,900	343,300		30,600	"
1972	562,300	500,300		62,000	USDA Forest Service
1973	224,100	224,100			1972 - 1987
1974	357,800	338,500	400	18,900	"
1975	733,400	614,200		119,200	"
1976	696,400	555,200		141,200	"
1977	696,800	644,200		52,600	"
1978	1,115,400	915,800		199,600	"
1979	1,260,200	1,113,200		147,000	"
1980	1,512,300	1,248,400		263,900	"
1981	1,412,400	1,228,200	50,100	134,100	"
1982	2,513,400	2,258,000	51,400	203,800	"
1983	2,784,600	2,375,500	78,600	330,600	"
1984	2,347,200	2,032,700	137,400	177,200	"
1985	2,906,500	2,620,400	87,600	198,500	"
1986	3,137,100	2,904,900	95,600	136,600	"
1987	873,600	834,500	37,700	1,400	"

* Does not include defoliation in wilderness and primitive areas 1975-1986.
** See "References" section.

RESULTS AND DISCUSSION

Based on the aerial detection surveys, hosts on approximately 873,600 acres of forest land in the Intermountain Region were defoliated by WSBW during 1987 (Figure 1, Table 2). Compared to defoliation detected in 1986 (Knapp 1986), this is a decrease of 2.3 million acres and the least amount of defoliation observed in the past 10 years.

Substantial reductions in both extent and intensity of defoliation occurred throughout forested areas. In southern Idaho, defoliation classified as heavy decreased from 1.3 million acres in 1986 to only 38,600 acres in 1987. Light and moderate defoliation accounted for approximately 95 percent of all defoliation observed.

Unseasonable fall or spring frosts purportedly act directly or indirectly to reduce populations (Fellin 1985). Throughout much of the Intermountain Region, in 1987, unseasonably warm spring temperatures were followed by unseasonably low temperatures on several occasions. Larval populations may have been reduced significantly resulting in lower defoliation levels. Additionally, substantial acreage on the Boise and Payette National Forests have been continuously defoliated since the early 1970's resulting in a significant reduction of host foliage.

While extent and intensity of new defoliation declined Regionwide, Douglas-fir mortality, apparently associated with defoliation, appears to have increased significantly, particularly on the Boise and Caribou National Forests. Typically, mortality occurred in intermediate sized, open-grown trees located on drier sites. Size of mortality areas varied from scattered single trees to entire stands. The increase in mortality may be attributed to 4 to 5 years of very heavy defoliation coupled with drought conditions in 1986 and 1987.

In some areas, Douglas-fir mortality attributed to WSBW was likely caused by Douglas-fir beetle (Dendroctonus pseudotsugae Hopkins) attacks on heavily defoliated, weakened trees during 1986. However, rapid foilage discoloration, usually symptomatic of bark beetle infestation, did not occur, making determination of causal agent(s) during aerial surveys impossible. Ground surveys will be conducted during 1988 to determine pests responsible for the extensive Douglas-fir mortality.

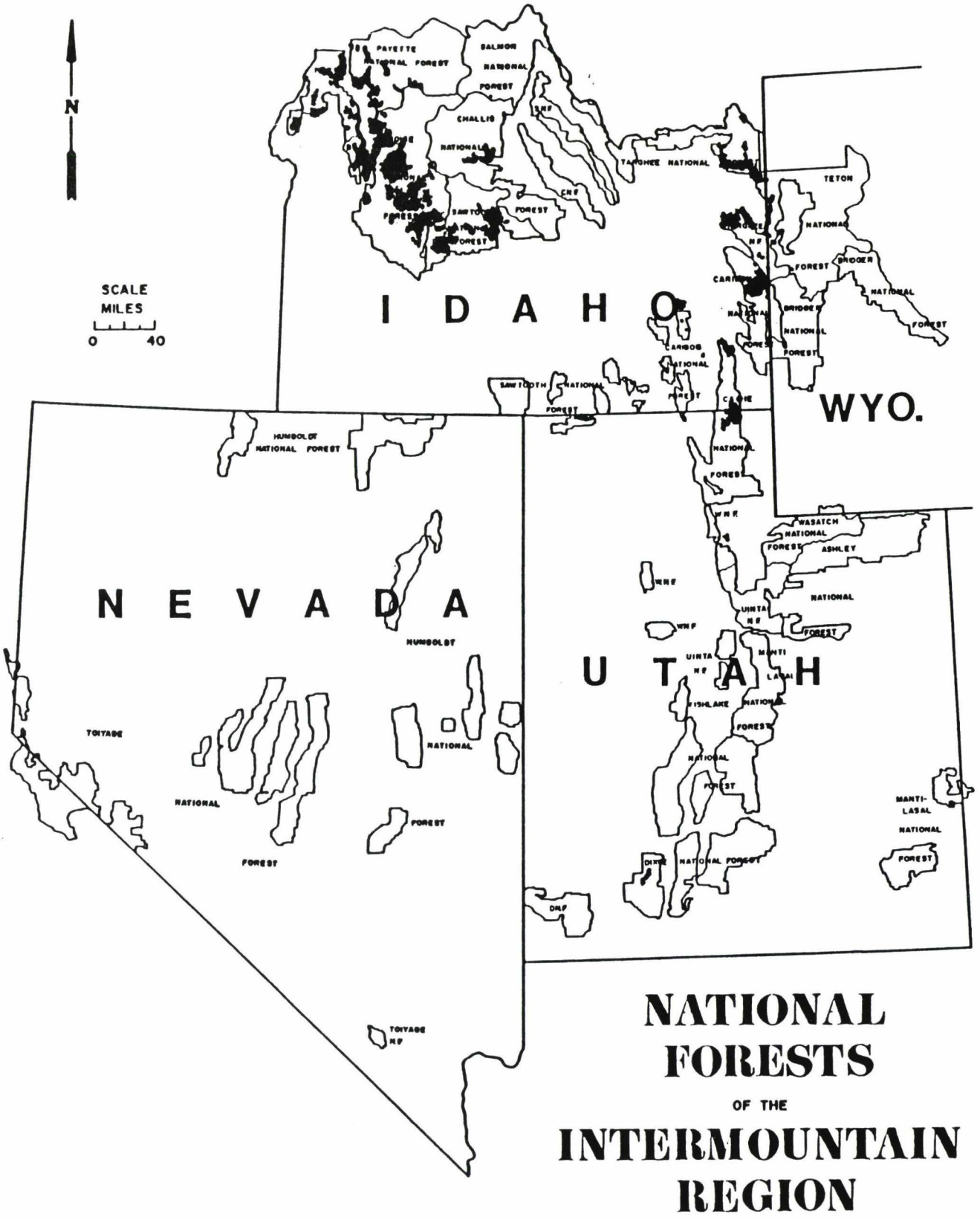


Figure 1. Areas infested by western spruce budworm during 1987 in the Intermountain Region.

Table 2.--Acres of defoliation by western spruce budworm in the Intermountain Region during 1986-87 as determined by aerial detection surveys.

Forest (and Adjacent Land)*	Year	Defoliation Intensity				Change (From 1986)
		Light	Moderate	Heavy	Total	
Boise	1987	337,400	58,000	31,300	426,700	- 707,000
	1986	76,900	302,200	754,600	1,133,700	
Bridger-Teton	1987	1,400	0	0	1,400	- 110,300
	1986	98,400	12,700	600	111,700	
Caribou	1987	32,300	15,100	4,600	52,000	- 224,900
	1986	47,000	141,100	88,800	276,900	
Challis	1987	16,900	4,000	0	20,900	- 14,000
	1986	32,600	2,300	0	34,900	
Dixie	1987	5,000	3,300	4,000	12,300	- 15,000
	1986	6,300	9,000	12,000	27,300	
Payette	1987	119,000	15,800	0	134,800	- 483,600
	1986	61,800	194,000	362,600	618,400	
Salmon	1987	60	540	0	600	- 29,000
	1986	29,600	0	0	29,600	
Sawtooth	1987	65,000	18,200	900	84,100	- 270,700
	1986	60,700	162,800	131,300	354,800	
Targhee	1987	104,400	9,200	1,800	115,400	- 341,400
	1986	266,800	171,400	18,600	456,800	
Wasatch-Cache	1987	10,000	15,400	0	25,400	- 37,700
	1986	41,700	5,200	16,200	63,100	
Southern Idaho totals	1987	675,060	120,840	38,600	834,500	-2,070,600
	1986	575,400	973,800	1,355,900	2,905,100	
Utah totals	1987	15,000	18,700	4,000	37,700	- 52,700
	1986	48,000	14,200	28,200	90,400	
Wyoming totals	1987	1,400	0	0	1,400	- 109,300
	1986	98,400	12,700	600	110,700	
R-4 totals	1987	691,460	139,540	46,600	873,600	-2,232,600
	1986	721,800	1,010,700	1,384,700	3,106,200	

* Portions of some Forests are not surveyed annually; therefore, actual acreage of defoliation may be substantially higher on these Forests.

Following is a brief summary of aerially observed conifer defoliation by WSBW during 1987 on individual National Forests in the Intermountain Region.

BOISE NATIONAL FOREST

After several years of increasing defoliation, a substantial reduction in WSBW activity occurred throughout the host type on the Forest. Approximately 426,700 acres of visible defoliation were observed during 1987,compared to over 1 million acres in 1986. Defoliation in 1986 was classified as predominantly heavy, whereas defoliation in 1987 was classified as predominantly light (337,400 acres of light defoliation, 58,000 acres of moderate defoliation, and 31,300 acres of heavy defoliation).

Heavy defoliation was concentrated in the Trinity Creek drainage on the Mountain Home Ranger District and near Atlanta on the Boise Ranger District. Elsewhere, light and moderate defoliation was scattered throughout affected host type.

Group and single tree mortality of predominantly Douglas-fir was noted throughout areas which have experienced several years of heavy defoliation. Mortality is located along Canyon Creek on the Lowman Ranger District, throughout the Mores Creek Summit area on the Idaho City Ranger District, and near Rocky Bar on the Mountain Home Ranger District.

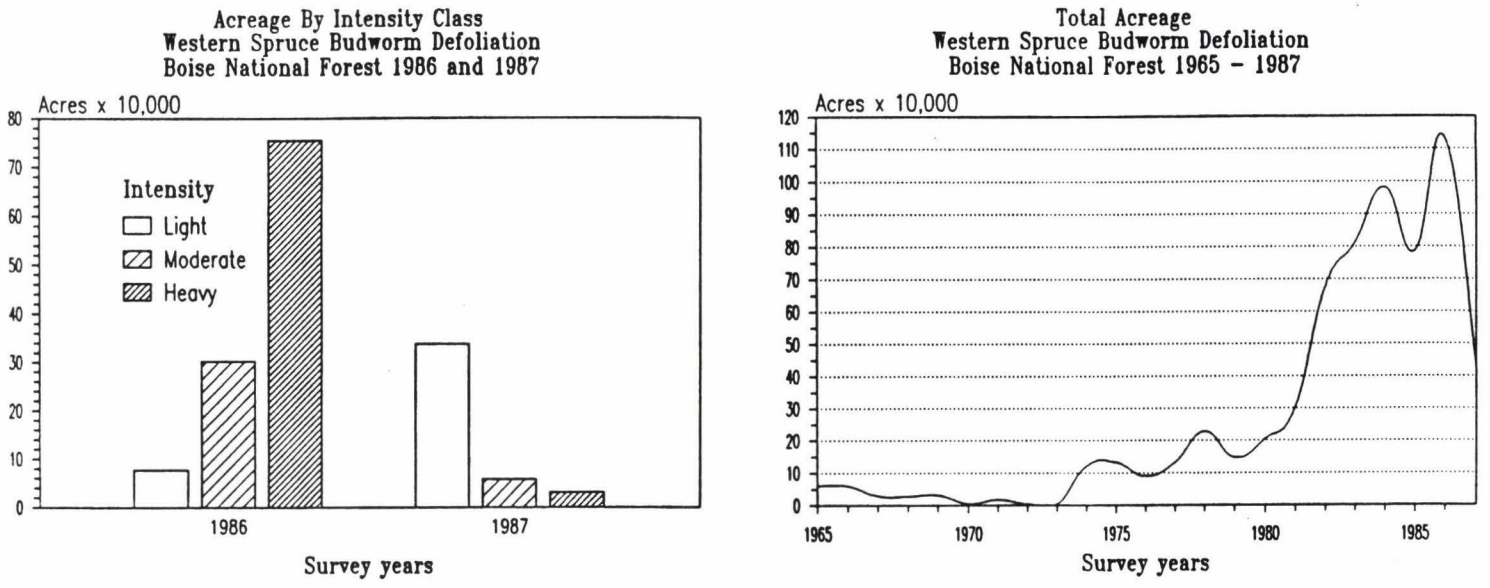


Figure 2.--Western spruce budworm activity on the Boise National Forest.

BRIDGER TETON NATIONAL FOREST

Extent and intensity of defoliation continued to decrease on the Bridger-Teton National Forest with approximately 1,400 acres of defoliation observed in 1987, compared with 111,700 acres in 1986. All defoliation mapped in 1987 was classified as light.

Defoliation was located along Mosquito Creek, Phillips Canyon, and along Bailey Creek on the Jackson Ranger District.

Ground checks indicate that WSBW occurred at aerially undetectable levels throughout portions of the Gros Ventre and Greys River Ranger Districts.

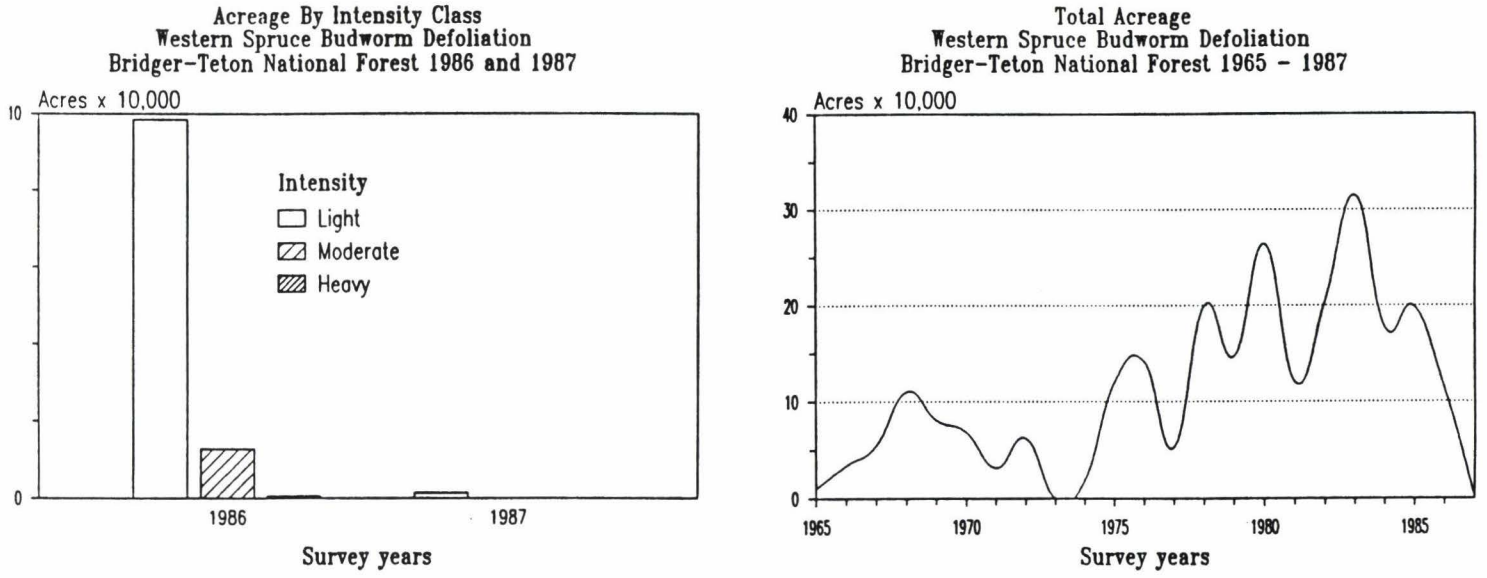


Figure 3.--Western spruce budworm activity on the Bridger-Teton National Forest.

CARIBOU NATIONAL FOREST

A substantial decrease in acreage and intensity of WSBW-caused defoliation occurred on the Forest in 1987. During 1986, host trees on 276,900 acres were visibly defoliated by WSBW, compared to 52,000 acres in 1987. Most defoliation was classified as light in 1987, whereas during the last several years, most defoliation had been classified as moderate or heavy. This decline in WSBW activity generally occurred Forestwide but was particulary evident north of McCoy Creek in areas administered by the Targhee National Forest.

On the Soda Springs Ranger District, light and moderate defoliation occurred throughout Caribou Basin, and pockets of heavy defoliation were scattered along the Bear River Range south of Soda Springs. Along the Bannock and Portnuef Ranges on the Pocatello Ranger District, small areas of light, moderate, and heavy defoliation were observed.

Extensive mortality of Douglas-fir, likely caused by WSBW in association with Douglas-fir beetle, occurred throughout portions of the McCoy and Jackknife Cr. drainages on the Soda Springs Ranger District. Dead and dying trees generally occurred in small stands on south facing slopes.

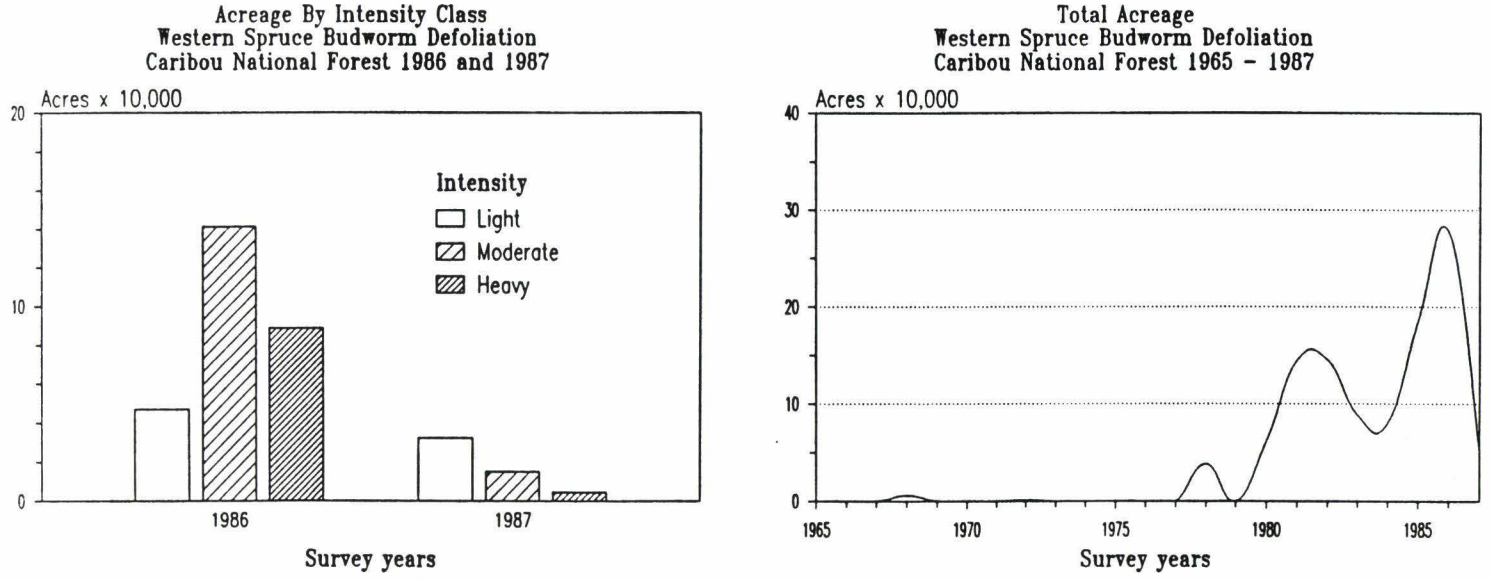


Figure 4.--Western spruce budworm activity on the Caribou National Forest.

CHALLIS NATIONAL FOREST

Approximately 20,900 acres of defoliation, all of light and moderate intensity, were mapped during 1987, compared to 34,900 acres in 1986.

Defoliation occurred infrequently throughout the Salmon River drainage from Basin Creek upstream to Squaw Creek.

Ground checks indicated that WSBW continues to infest substantial portions of the Forest not normally surveyed.

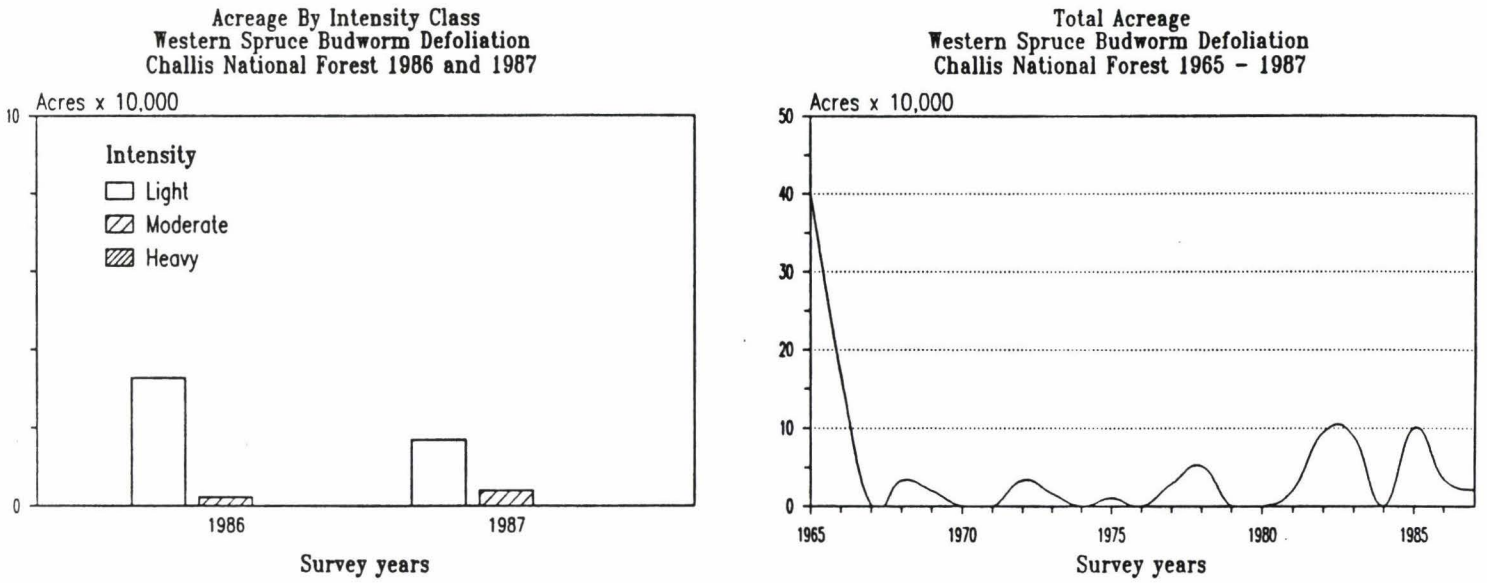


Figure 5.--Western spruce budworm activity on the Challis National Forest.

DIXIE NATIONAL FOREST

Acreage of WSBW activity decreased by over 50 percent from 1986 levels. Approximately 12,300 acres of defoliation were mapped during 1987, compared to 27,300 acres in 1986. Much of the acreage reduction in defoliation occurred in high-elevation spruce stands located north of Brian Head Mountain. In contrast to 1986, more defoliation was classified as light than heavy.

WSBW activity was located throughout the Horse Valley, Little Valleys, Little Creek Peak, and Grouse Peak areas northeast of Cedar City on the Cedar Ranger District.

Host mortality, ranging from single trees to entire stands, apparently resulting from several years of heavy defoliation, was noted near Little Creek Peak, Twin Peak, and Horse Creek Peak.

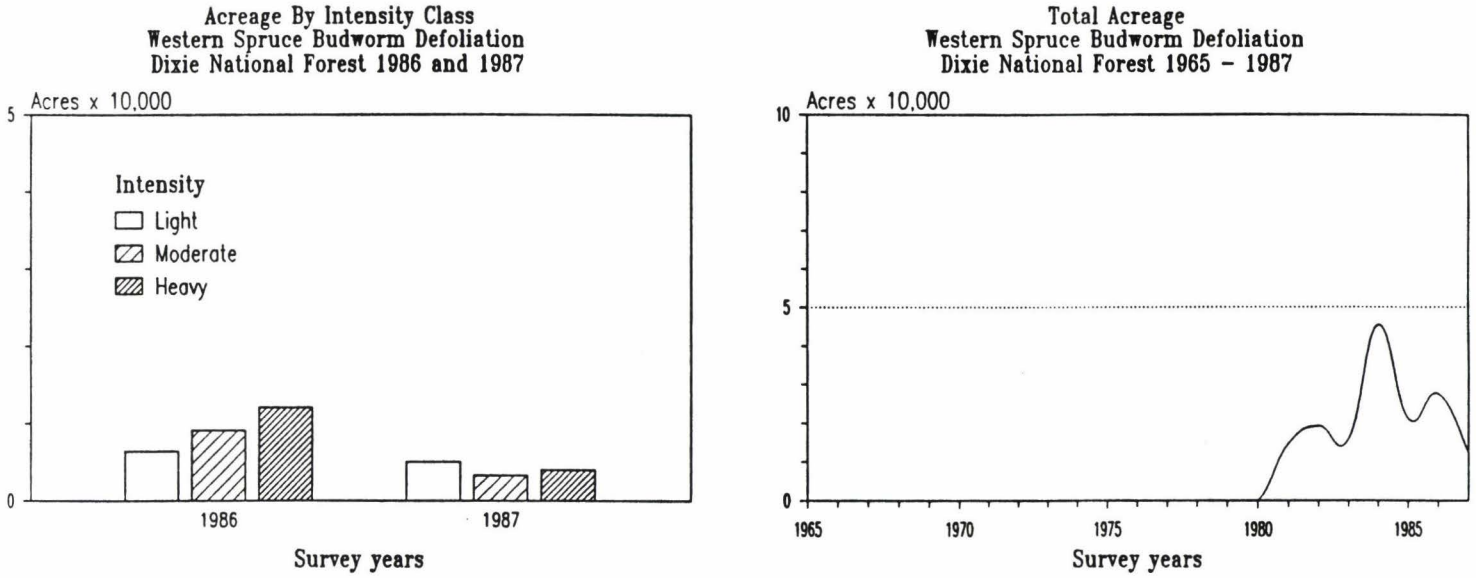


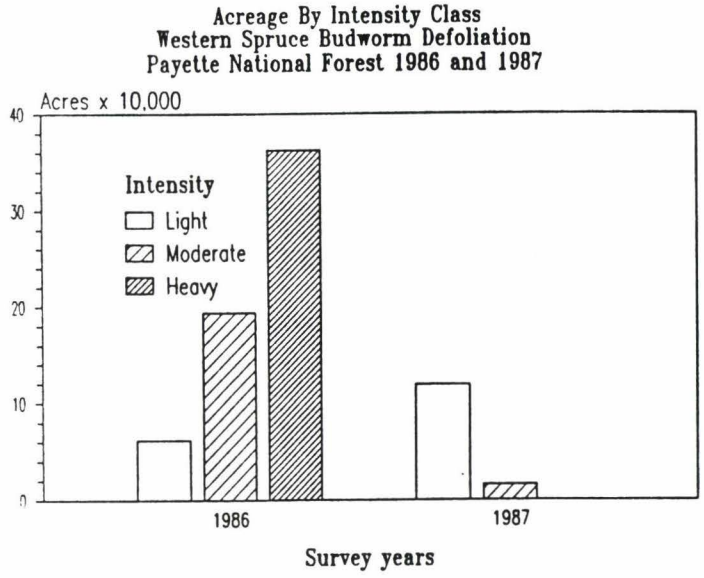
Figure 6.--Western spruce budworm activity on the Dixie National Forest.

PAYETTE NATIONAL FOREST

Defoliation extent and intensity decreased substantially throughout the Forest. Approximately 134,800 acres of defoliation were mapped during 1987, compared to 618,400 acres in 1986. Reduction in WSBW activity generally occurred Forestwide but was most apparent throughout the Weiser River drainages, along the east side of the West Mountains, and throughout the Gold Fork area.

All defoliation was of light and moderate intensity. Most defoliation is located along portions of the North Fork of the Payette River and Lake Fork drainages north of McCall on the McCall Ranger District and throughout the French Creek, Partridge Creek, and Elkhorn Creek drainages on the New Meadows Ranger District. Elsewhere on the Forest, defoliation was observed along Cuddy and Hitt Mountains on the Council and Weiser Ranger Districts, respectively.

Areas which have experienced several years of heavy defoliation, including areas with no current WSBW defoliation, continue to sustain single and group mortality of Douglas-fir and true fir. Some mortality is likely caused by bark beetles attacking weakened trees.



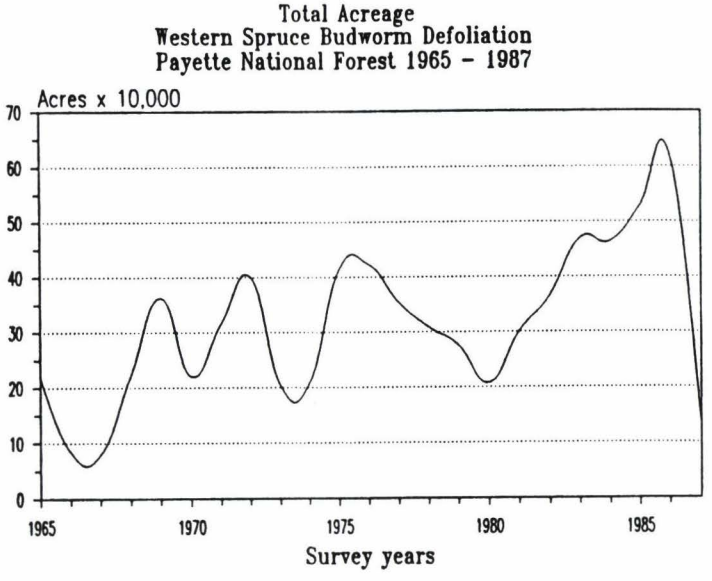


Figure 7.--Western spruce budworm activity on the Payette National Forest.

SALMON NATIONAL FOREST

Only 600 acres of visible defoliation were mapped during 1987, compared to 29,600 acres in 1986. Moderate defoliation was observed along Little Deer Creek, and light defoliation was observed along Rams Creek on the Cobalt Ranger District.

Ground checks indicate WSBW activity is present throughout most of the Forest but at levels which are not aerially detectable.

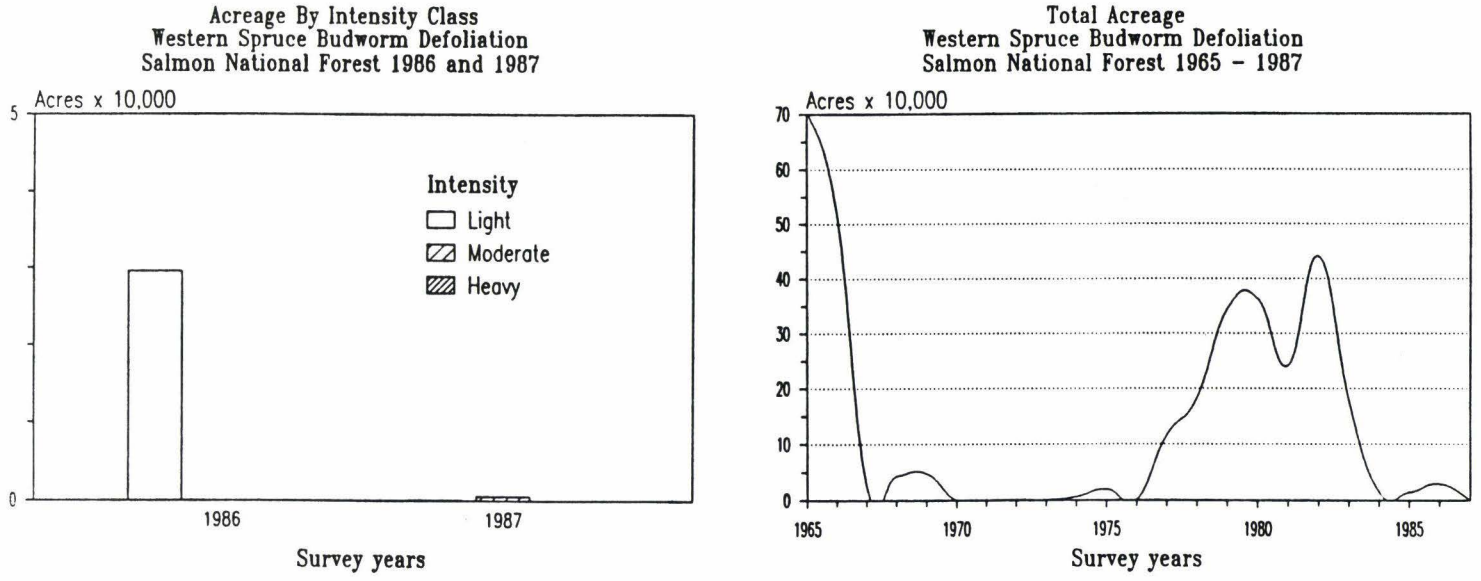


Figure 8.--Western spruce budworm activity on the Salmon National Forest.

SAWTOOTH NATIONAL FOREST

Extent and intensity of defoliation decreased Forestwide. Approximately 84,100 acres of defoliation were recorded during 1987, compared to 355,800 acres of defoliation in 1986. During 1986, 131,300 acres of host trees were classified as heavy; while only 900 acres of heavy defoliation were noted in 1987.

Heavy defoliation occurred along Clear Creek in the Raft River Range on the Burley Ranger District and near Canonball Mountain on the Fairfield Ranger District. Light and moderate defoliation was scattered throughout the South Fork of the Boise River drainage on the Fairfield Ranger District and along the Big Wood River drainage from Hailey north to Galena Summit on the Ketchum Ranger District. Light defoliation was mapped on Bald Mountain near Ketchum.

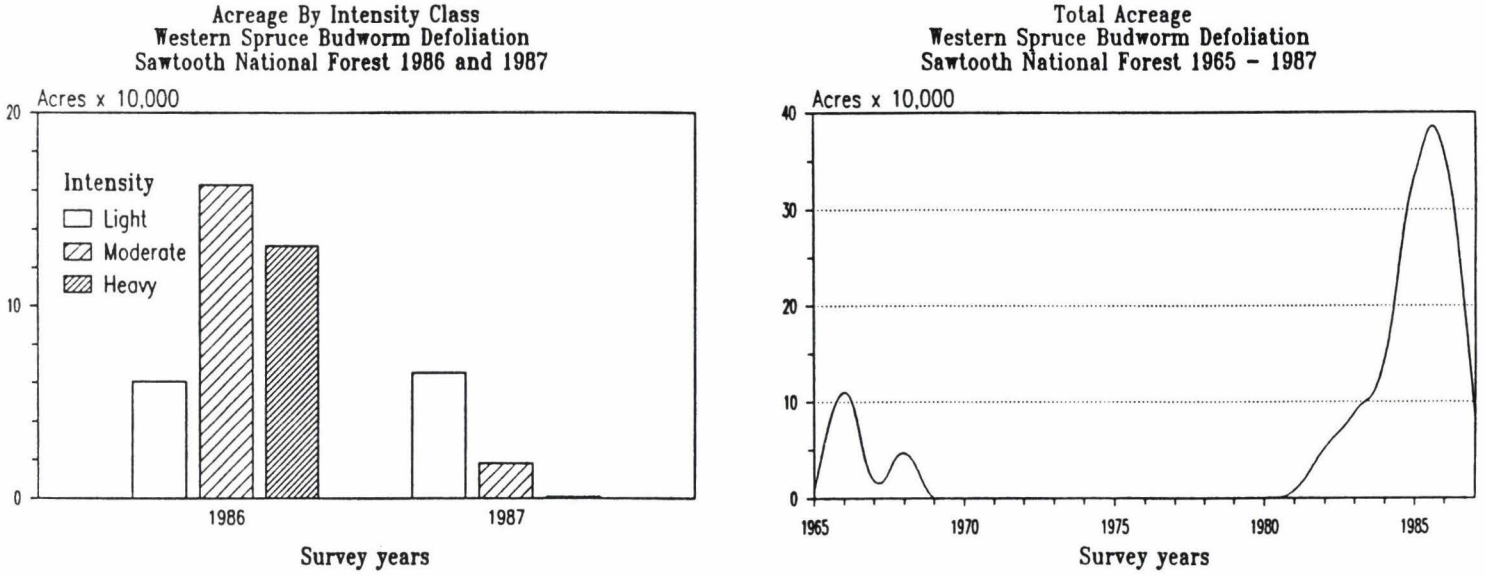


Figure 9.--Western spruce budworm activity on the Sawtooth National Forest.

TARGHEE NATIONAL FOREST

WSBW activity decreased significantly throughout all areas surveyed. Approximately 115,400 acres of defoliation were observed during 1987, compared to 456,800 during 1986. Intensity of defoliation declined from previous years with only 1,800 acres classified as heavy compared to 18,600 acres in 1986.

Light and moderate defoliation occurred infrequently throughout host type on the Ashton Ranger District. Heavy defoliation was mapped along the northern portion of Big Bend Ridge on the Island Park Ranger District; elsewhere on the District, defoliation was light or moderate. On the Teton Basin Ranger District, light defoliation occurred along the west side of the Teton Mountains, and light and moderate defoliation occurred throughout the Big Hole Mountains. Light defoliation occurred along the Big Elk Creek, Little Elk Creek, and Indian Creek drainages on the Palisades Ranger District. No defoliation was observed in the Centennial Mountains on the Dubois Ranger District.

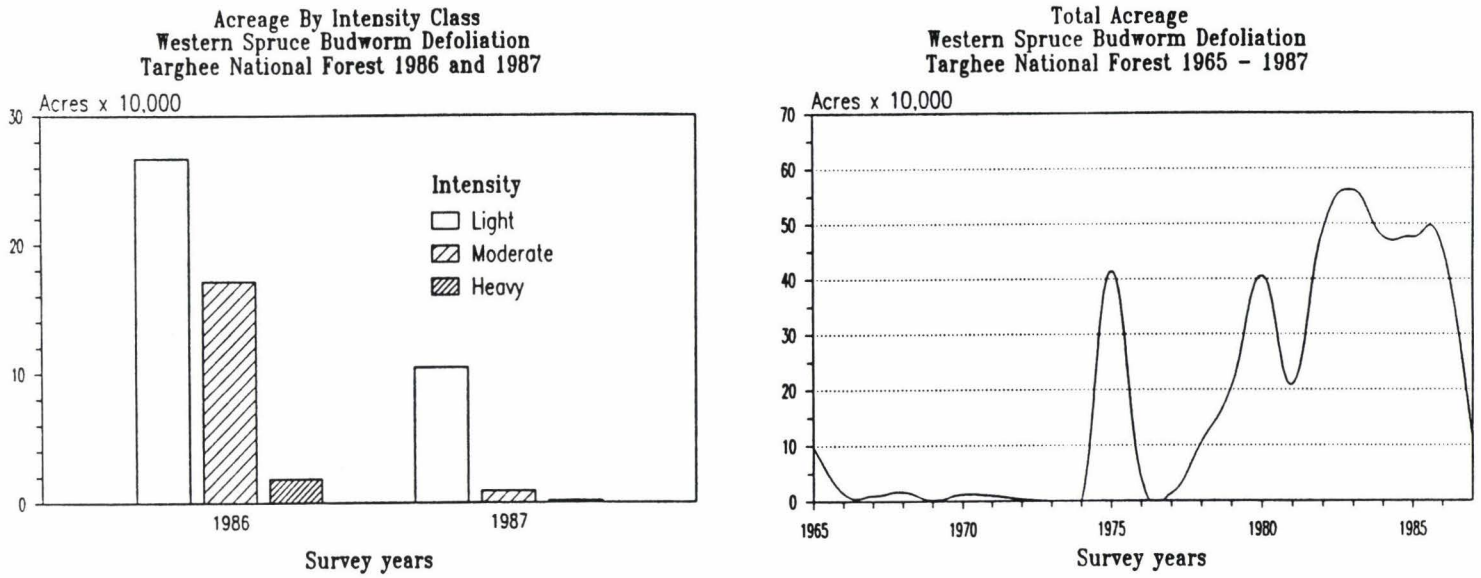


Figure 10.--Western spruce budworm activity on the Targhee National Forest.

WASATCH-CACHE NATIONAL FOREST

WSBW continued to defoliate Douglas-fir and true fir along portions of the Logan River drainage; however, acreage of defoliation decreased. Approximately 25,400 acres of defoliation were observed in 1987, compared to 63,100 acres in 1986. Intensity of defoliation decreased with no heavy defoliation being observed.

Light to moderate defoliation was scattered throughout drainages along the north side of Logan Canyon from Tab Hollow north to the Idaho State boundary. Mostly moderate defoliation occurred from Temple Peak north to Stump Hollow. Light defoliation was observed in Beaver Mountain Ski Area.

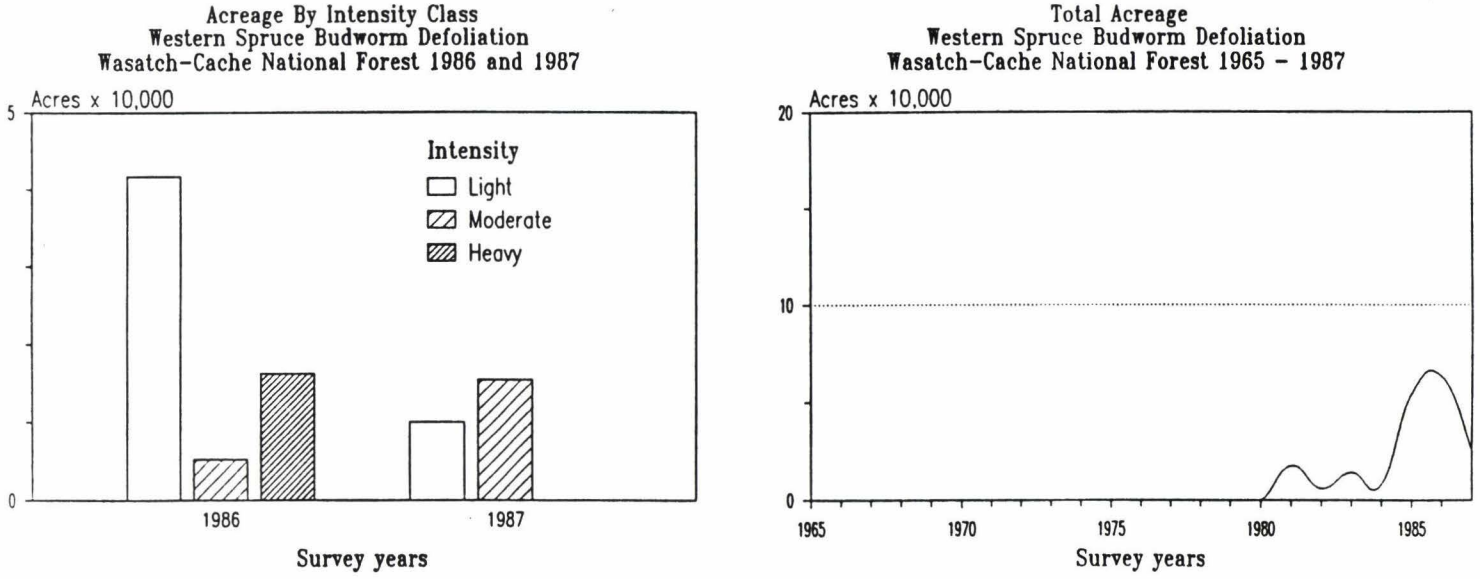


Figure 11.--Western spruce budworm activity on the Wasatch-Cache National Forest.

MANAGEMENT ALTERNATIVES

No Action: Pest management alternatives would not be implemented, and an infestation would be allowed to continue until natural abatement occurs. Resource impacts including growth loss, topkill, reduced seed production, and some mortality--particulary in the understory--would be accepted.

Direct Suppression: One or more available registered insecticides including carbaryl, acephate, malathion, or Bacillus thuringiensis Berliner, a microbial insecticide, would be applied to the entire infestation or to a portion thereof. Approximate costs would be $10 to $15 per acre. Short-term impacts to the various resources would be reduced significantly for a 2- to 3-year period, after which the population would likely equal that found in untreated areas.

Because treatment would preserve the food base, a chronic infestation could develop, particularly if suppression is undertaken whenever the population resurges to damaging levels.

Silvicultural Management: Stands susceptible to WSBW activity would be managed to reduce potential for damage. Management actions include:

(1) Favoring a diversity of site-suited, seral, host, and non-host species.

(2) Maintaining or improving stand vigor by conducting timely thinnings and selecting against trees which display evidence of previous heavy defoliation or are affected with other damaging agents including dwarf mistletoe and root/stem decays.

(3) Harvesting susceptible stands at maturity using even-age regeneration systems.

RECOMMENDATIONS

WSBW populations appear to be declining Regionwide. Hosts in many areas which have been continuously defoliated since the late 1970's showed little or no defoliation in 1987. While this trend may continue, until stand susceptibility is reduced, WSBW will remain a long-term management problem. To deal effectively with the WSBW infestation and reduce impact of future infestations, an integrated approach is recommended with silvicultural management being the base program. Stands with highest resource value and potential for impact should be treated first.

Direct suppression may be considered in high-value young stands and in recreational or seed production areas where short-term protection is desirable and economically feasible.

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